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MEMORANDUM

X-507

MEASUREMENTS OF DRAG AND STATIC

ON A BLUNT-NOSED 10° HALF-ANGLE

WEDGE AT MACH NUMBER 15

By Dale L. Compton

Aeronautics Research Center
Moffett Field, Calif.

CLASSIFICATION CHANGED TO
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NND-11132
EFFECTIVE DATE
JANUARY 14, 1962

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

April 1961

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1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

2. The second step is to gather relevant information and data. This can be done through research, consultation with experts, or by analyzing existing data sets.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable parts and determining the best approach to solve each part.

4. The fourth step is to implement the plan. This involves carrying out the tasks and activities that have been identified in the plan.

5. The fifth step is to evaluate the results. This involves comparing the actual outcomes with the expected outcomes and identifying any areas for improvement.

6. The sixth step is to communicate the findings. This involves sharing the results of the analysis with the relevant stakeholders and providing recommendations for action.

7. The seventh step is to monitor and review the process. This involves keeping track of the progress of the project and making adjustments as needed to ensure that the project is completed successfully.

8. The eighth step is to document the process. This involves creating a record of the steps taken and the results achieved, which can be used for future reference and learning.

9. The ninth step is to reflect on the experience. This involves thinking about what was learned from the project and how it can be applied to future projects.

10. The tenth step is to celebrate success. This involves acknowledging the achievements of the team and celebrating the successful completion of the project.

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1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

2. Next, it is important to gather relevant information and data. This can be done through research, consultation with experts, or by analyzing existing data sets.

3. Once the information is gathered, the next step is to analyze it. This involves identifying patterns, trends, and relationships that can help in understanding the problem.

4. After analysis, the next step is to develop a solution or plan. This should be based on the findings from the analysis and should take into account the constraints and requirements of the task.

5. Finally, the solution should be implemented and monitored. This involves putting the plan into action and tracking its progress to ensure that it is effective and meets the requirements.

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1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

1. The first step in the process of developing a business plan is to conduct a thorough market research. This involves identifying the target market, understanding their needs and preferences, and analyzing the competitive landscape. Market research can be conducted through various methods, including surveys, interviews, and focus groups.

1. *Il presente documento è riservato ai soli fini di cui è prevista la sua elaborazione e non deve essere diffuso o utilizzato al di fuori di questi scopi.*

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TECHNICAL MEMORANDUM X-507

FREE-FLIGHT MEASUREMENTS OF DRAG AND STATIC

STABILITY FOR A BLUNT-NOSED 10° HALF-ANGLE

CONE AT MACH NUMBER 15*

By Dale L. Compton

SUMMARY

Experimental free-flight measurements of drag and static stability have been made on a blunt-nosed 10° half-angle cone at a nominal Mach number of 15 and a nominal Reynolds number of 2.8×10^6 . It was found that the model is statically stable throughout the angle-of-attack range tested, and that the experimental pitching moment could be approximated by a cubic polynomial.

The results are compared with two simple theories. Both theories show good agreement with the experimental drag coefficient but overestimate, by approximately 50 percent, the slope of the experimental moment curve at zero angle of attack.

INTRODUCTION

At the present time, little experimental data is available at hypersonic Mach numbers on the stability of blunt, nonlifting shapes suitable for atmosphere re-entry. The purpose of this report is to present data at a nominal Mach number of 15 and a nominal Reynolds number of 2.8×10^6 on the static stability and drag of a blunt-nosed 10° half-angle cone, and to compare the results with two simple theories.

SYMBOLS

A	frontal area, sq ft
C_{L_α}	lift-curve slope, per radian
C_D	drag coefficient, $\frac{\text{drag}}{q_\infty A}$, dimensionless
C_m	pitching-moment coefficient, $\frac{\text{pitching moment}}{q_\infty A d}$, dimensionless

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$C_{m\alpha}$	pitching-moment-curve slope, per radian	
$C_{N\alpha}$	normal-force-curve slope, per radian	
C_p	pressure coefficient	
d	maximum body diameter, ft	
I_y	transverse moment of inertia, slug-ft ²	
m	mass of model, slugs	A
M	Mach number, dimensionless	4
M_O	$\frac{\rho A d}{2 I_y} C_m$, ft ⁻²	4
$M_{1,2}$	cubic restoring moment coefficients, defined by equation (3), ft ⁻²	
q_∞	free-stream dynamic pressure, lb/sq ft	
R	Reynolds number based on maximum diameter, dimensionless	
V	velocity along flight path, ft/sec	
X	distance along flight path, ft	
x_{cg}	axial distance from model nose to center-of-gravity position, ft	
x_{cp}	axial distance from model nose to center-of-pressure position, ft	
α	angle of pitch (in the vertical plane), deg	
α_R	$\sqrt{\alpha^2 + \beta^2}$, deg	
$\bar{\alpha}_R$	root mean square resultant angle of attack defined in equation (2), deg	
β	angle of yaw (in the horizontal plane), deg	
λ	wave length of pitching oscillation, ft/cycle	
θ	slope of the body meridian	
ρ	free-stream air density, slugs/cu ft	
ξ	dummy variable in equation (2)	

Subscripts

max	maximum
min	minimum
s	stagnation point

MODELS AND TESTS

Figure 1 is a drawing of the model. It has a maximum diameter of 0.45 inch and a center-of-gravity position at 48.3 percent of the diameter from the nose. The front section was machined from titanium and the rear section from 7075-T6 aluminum in order to obtain the desired center-of-gravity location. The small screw on the rear was used to hold the model flush on the front face of the sabot. The point on the base of the screw served as a reference point for reading the position of the model in the shadowgraphs.

A picture of a model in its sabot is shown in figure 2. (The apparent roughness on the model is caused by wax which was sprayed on in order to reduce highlights in the photograph.) The sabot was machined from ethyl cellulose plastic and was split in half to allow model and sabot separation which was accomplished by the action of aerodynamic forces on the front lip of the sabot.

All tests were conducted by firing models into the Mach number 3 countercurrent air stream of the Ames Supersonic Free-Flight Wind Tunnel. The models were launched from a shock-heated helium gun with a 90-mm diameter pump tube and a 37-mm diameter smooth-bore launch tube. The nominal velocity of the model was 8500 feet per second, which resulted in a nominal Mach number of 15 and a nominal Reynolds number of 2.8×10^6 . Nine data stations, spaced at 3-foot intervals along the length of the wind tunnel, recorded model positions on shadowgraphs. Two typical shadowgraphs are shown in figure 3. Time intervals between stations were recorded on chronographs. The wind tunnel and its instrumentation are described more fully in reference 1.

The data from each run were a time-distance history and an angle of pitch and yaw history obtained from the shadowgraphs and from the chronograph readings. The drag coefficient was computed from the time-distance history by the method described in reference 2. The wave length of each motion was determined from the angle of pitch and yaw history, and the static stability derivative, $C_{m\alpha}$, was computed from the equation (ref. 3)

$$C_{m\alpha} = - \frac{8\pi^2 I_y}{\lambda^2 \rho A d} \quad (1)$$

A linear variation of pitching moment with angle of attack is assumed in the development of equation (1).

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THEORETICAL PREDICTIONS

Theoretical values for the drag and static stability were computed from two methods. The first was the familiar modified Newtonian impact theory, where $C_p = C_{ps} \sin^2 \theta$. Computations for this method were carried only to the angle of attack at which part of the body becomes rearward facing, $\alpha = 10^\circ$. The second method will be referred to as the modified Newtonian Prandtl-Meyer method and consisted of matching the modified Newtonian pressure coefficient with a Prandtl-Meyer expansion at the point on the body where the pressure gradients given by both methods were the same (see ref. 4). When the body was at angle of attack, the pressures on the body in the plane of pitch were assumed to have the modified Newtonian Prandtl-Meyer value for the local angle presented to the flow, and a cosine variation of pressure was assumed around the body between the upper and lower meridians. No computational difficulty existed for carrying this method beyond $\alpha = 10^\circ$ and the computations were carried to $\alpha = 20^\circ$.

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RESULTS AND DISCUSSION

Experimental measurements of drag and static stability are presented in table I. Included in this table are the Mach numbers, Reynolds numbers, maximum and minimum resultant angles of attack (the largest and smallest combined angles of pitch and yaw), and pertinent model measurements for each flight.

The experimental drag data are shown in figure 4, where C_D is plotted as a function of root mean square resultant angle of attack, $\bar{\alpha}_R$, defined as

$$\bar{\alpha}_R^2 = \frac{\int_0^X (\alpha^2 + \beta^2) d\xi}{\int_0^X d\xi} \quad (2)$$

(It is shown in ref. 5 that $\bar{\alpha}_R$ is the correct parameter against which to plot C_D for free-flight tests.) Theoretical values of the drag coefficient computed by the two methods previously described are also shown in figure 4. (No allowance has been made for base drag since computations indicate that it will be less than 1 percent of the calculated values.) It can be seen that both theories predict drag coefficients about 10 percent greater than the experimental values.

The raw experimental static stability data are shown in figure 5, where the values of $C_{m\alpha}$, computed by assuming a linear variation of

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pitching moment with angle of attack, are plotted as a function of maximum resultant angle of attack. The vertical bar at each point shows the possible scatter due to experimental error. Thus the observed variation in $C_{m\alpha}$ with angle of attack must be due to a nonlinearity in the pitching-moment curve. The group of data was then fitted by the method of Rasmussen (ref. 6). In this method a pitching moment is assumed of the form

$$M_O = - M_1 \left(\frac{\alpha_R}{57.3} \right) - 2M_2 \left(\frac{\alpha_R}{57.3} \right)^3 \quad (3)$$

where

$$M_O = \frac{\rho A d}{2 I_y} C_m \quad (4)$$

and a simple relation is derived between the $C_{m\alpha}$ obtained from free-flight data fitted by linear equations and the true local value of the pitching moment. (The true local value is that which would be observed in a wind tunnel with the model held at constant angle of attack.) The pitching-moment coefficients, M_1 and M_2 , were computed from the observed wave lengths and maximum and minimum resultant pitching amplitudes by the equation (derived in ref. 6)

$$\left(\frac{2\pi}{\lambda} \right)^2 = M_1 + 1.44 M_2 \left[\left(\frac{\alpha_{Rmax}}{57.3} \right)^2 + \left(\frac{\alpha_{Rmin}}{57.3} \right)^2 \right] \quad (5)$$

Since this method requires only two runs to determine M_1 and M_2 , the data were fitted by the method of least squares, and the coefficients were found to be

$$M_1 = 0.0572$$

$$M_2 = 0.149$$

An indication of the validity of the assumption of a cubic pitching moment may be seen in figure 6, where $(2\pi/\lambda)^2$ is plotted as a function of $(\alpha_{Rmax}/57.3)^2 + (\alpha_{Rmin}/57.3)^2$. It can be seen from the plot that the three points fall very closely on a straight line and therefore the cubic pitching moment is an excellent assumption.

From the coefficients, the true local values of $C_{m\alpha}$ and C_m were computed and are shown plotted as a function of angle of attack in figures 7 and 8, respectively. The values of $C_{m\alpha}$, obtained from the linear analysis of the raw data, are shown in figure 7 as bars over the angle-of-attack range covered by each flight.

The values of $C_{m\alpha}$ and C_m , computed from modified Newtonian theory and modified Newtonian Prandtl-Meyer theory, are also shown in figures 7 and 8. Both theories predict values of $C_{m\alpha}$ about 50 percent greater than measured at $\alpha = 0^\circ$. It should be pointed out that while this

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discrepancy appears serious, its magnitude is dependent on the proximity of the center of gravity to the center of pressure, and a better indication of the ability of the theory to successfully predict stability is its ability to predict center of pressure. Both theories indicate a center of pressure at 53.8 percent of the diameter from the nose, indicating a theoretical static margin of 5.5 percent of the diameter. It was not possible to obtain experimental center-of-pressure measurements from the test data, but an estimate based on the experimental $C_{m\alpha}$ and the modified Newtonian value for $C_{N\alpha}$ places x_{cp} at 51.3 percent, indicating the experimental static margin to be 3.0 percent. Hence the discrepancy between the theoretical center of pressure and the estimated actual center of pressure is on the order of 3 percent of the diameter.

The agreement between modified Newtonian Prandtl-Meyer theory and experiment improves in this case with increasing angle of attack, the difference being only 5 percent in $C_{m\alpha}$ and 18 percent in C_m at $\alpha = 20^\circ$.

CONCLUSIONS

Experimental free-flight measurements of drag and static stability have been made on a blunt-nosed 10° half-angle cone at a nominal Mach number of 15 and a nominal Reynolds number of 2.8×10^6 .

The configuration was found to be statically stable throughout the angle-of-attack range tested. It was found that the experimental data could be correlated very well with the assumption of a cubic pitching-moment curve.

Two simple theories - modified Newtonian and modified Newtonian with a Prandtl-Meyer expansion matched at the point on the surface where the pressure gradients are equal - were found to overestimate the slope of the moment curve at $\alpha = 0^\circ$ by approximately 50 percent.

Both theories gave a satisfactory estimate of the drag coefficient.

Ames Research Center

National Aeronautics and Space Administration
Moffett Field, Calif., Oct. 17, 1960

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6. Rasmussen, Maurice L.: Determination of Nonlinear Pitching-Moment Characteristics of Axially Symmetric Models From Free-Flight Data. NASA TN D-144, 1960.

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TABLE I.- TEST CONDITIONS AND DATA

Test number	M	$R \times 10^{-6}$	α_{Rmax}' deg	α_{Rmin}' deg	$\bar{\alpha}_R'$ deg	C_D	$C_{m\alpha}$ (linear analysis)	d, in.	$I_y \times 10^8$ slug-ft ²	$\frac{x_{cg}}{d}$
592	14.59	3.39	26.5	1.7	18.5	0.747	-0.067	0.4499	1.87	0.482
660	16.46	2.55	33.0	9.5	25.1	.798	-.087	.4503	1.87	.484
661	15.75	2.46	16.5	5.8	12.0	.730	-.050	.4495	1.92	.483

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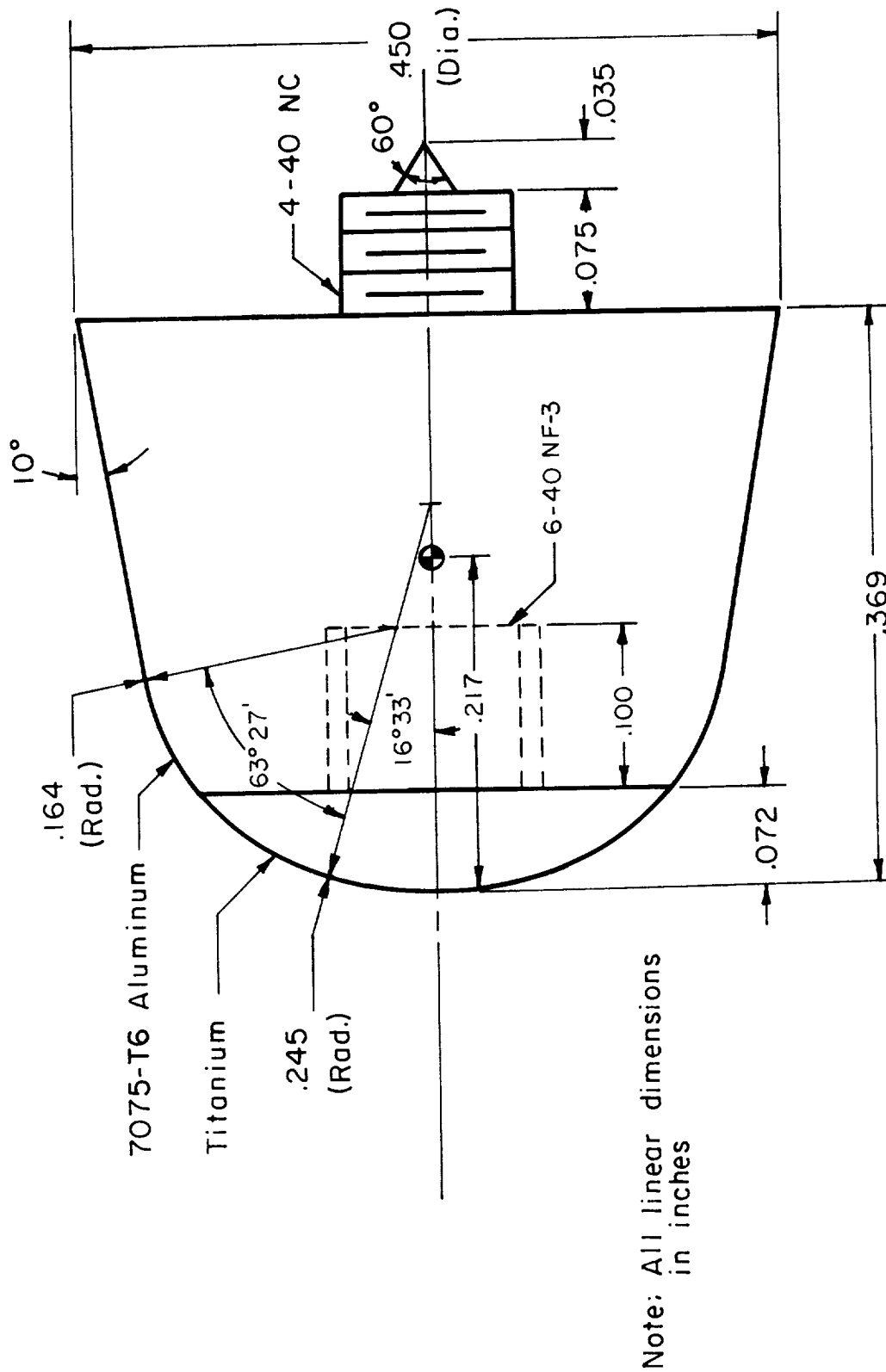
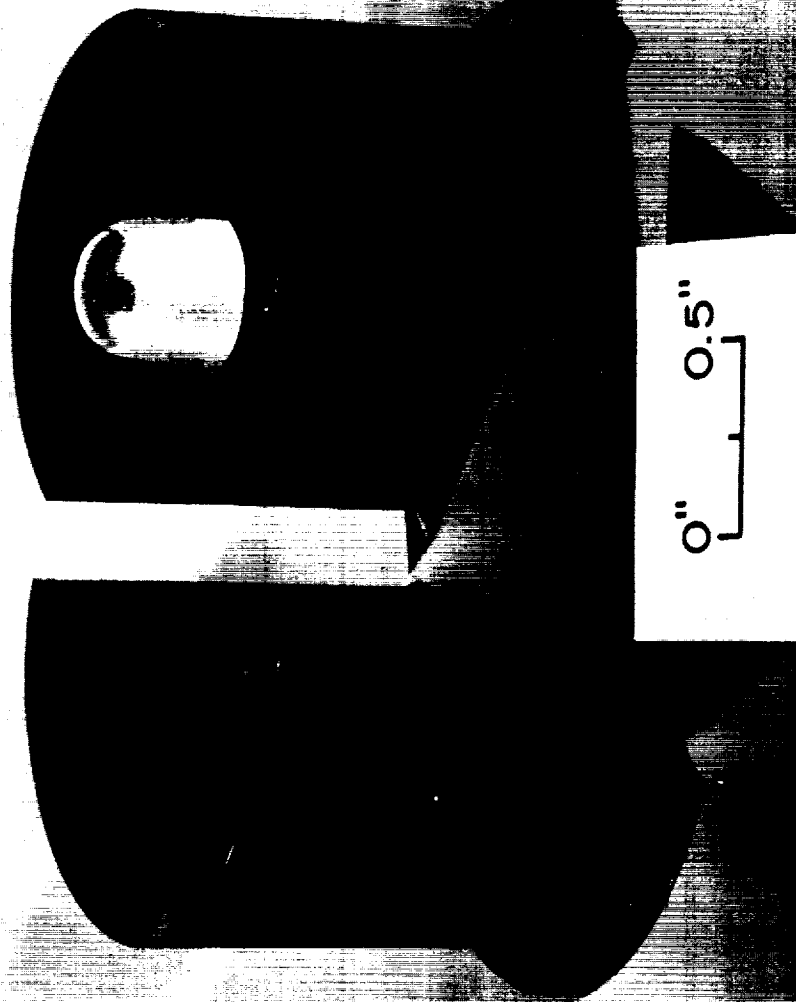


Figure 1.- Sketch of model

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Figure 2.- Photograph of a model and sabot.

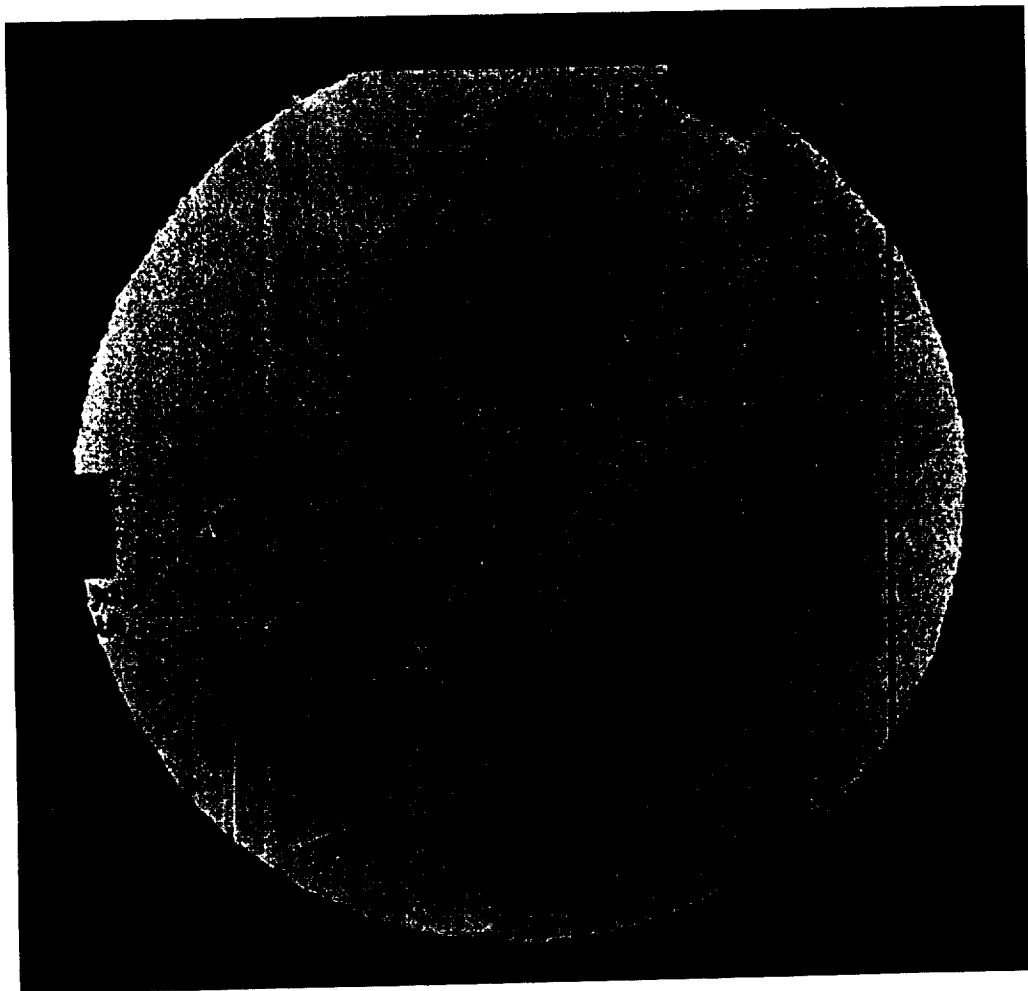
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CONFIDENTIAL

CONFIDENTIAL

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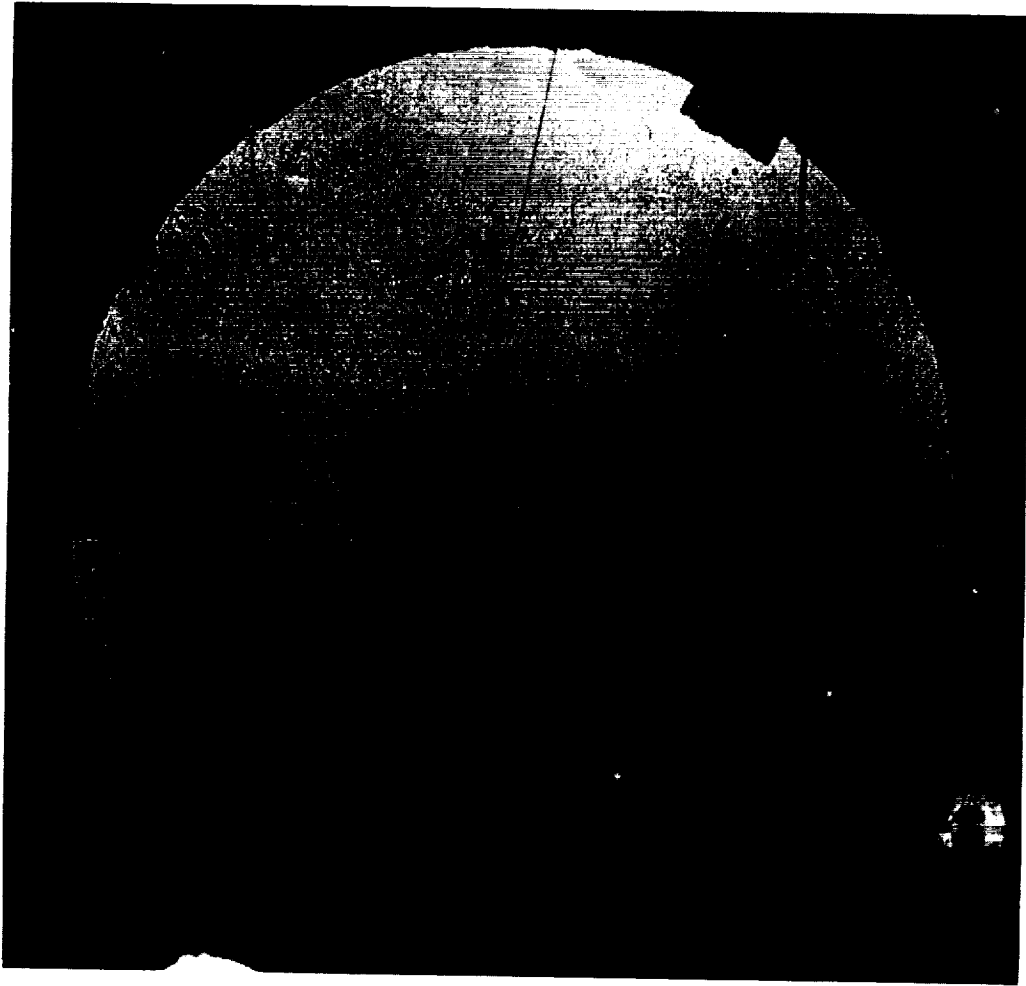
(a) $M = 15.3$, $R = 3.57 \times 10^6$, $\alpha = 3.2^\circ$

Figure 3.- Typical shadowgraphs.

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(b) $M = 13.9$, $R = 3.24 \times 10^6$, $\alpha = 22.8^\circ$ A-25809

Figure 3.- Concluded.

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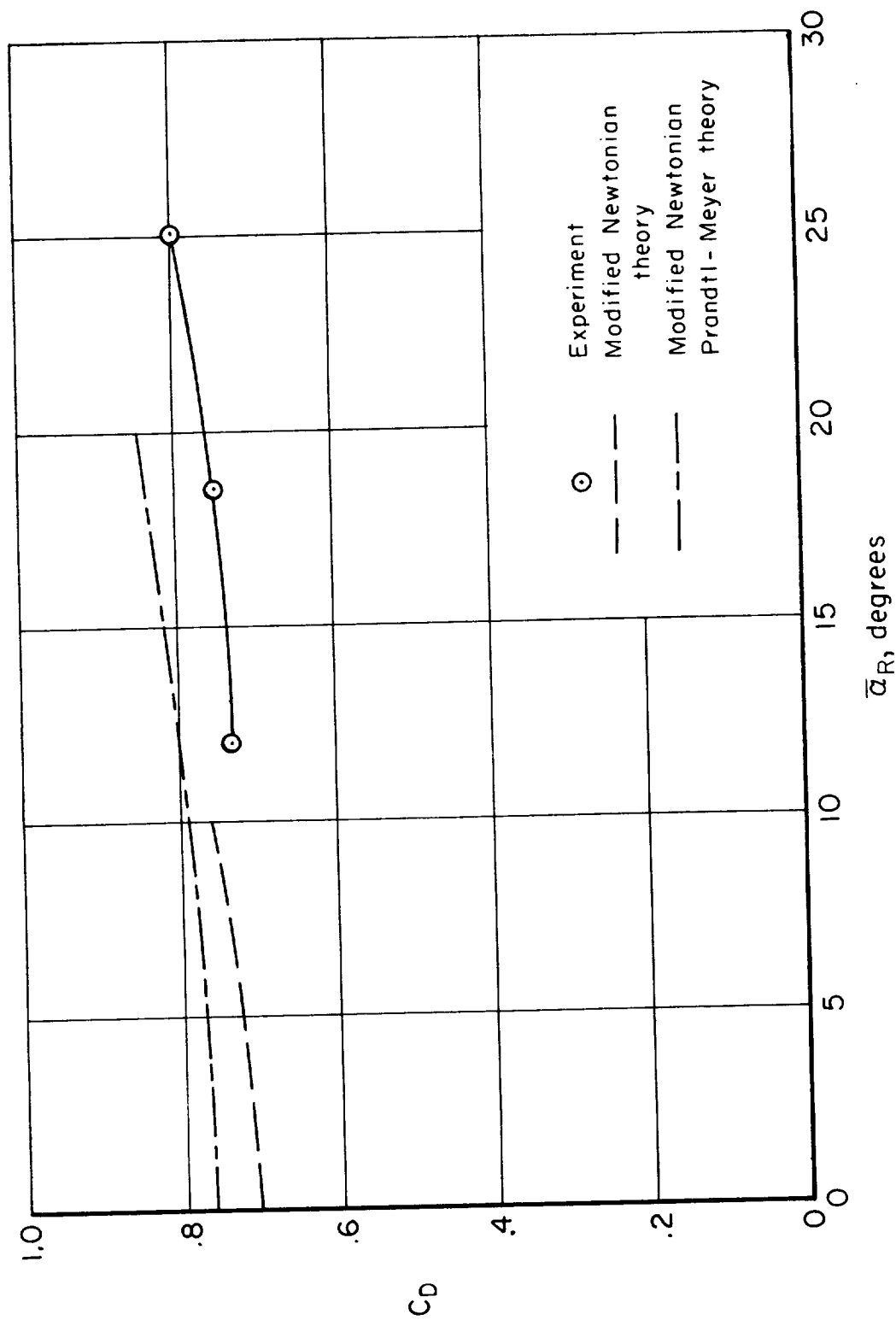


Figure 4.- Drag results.

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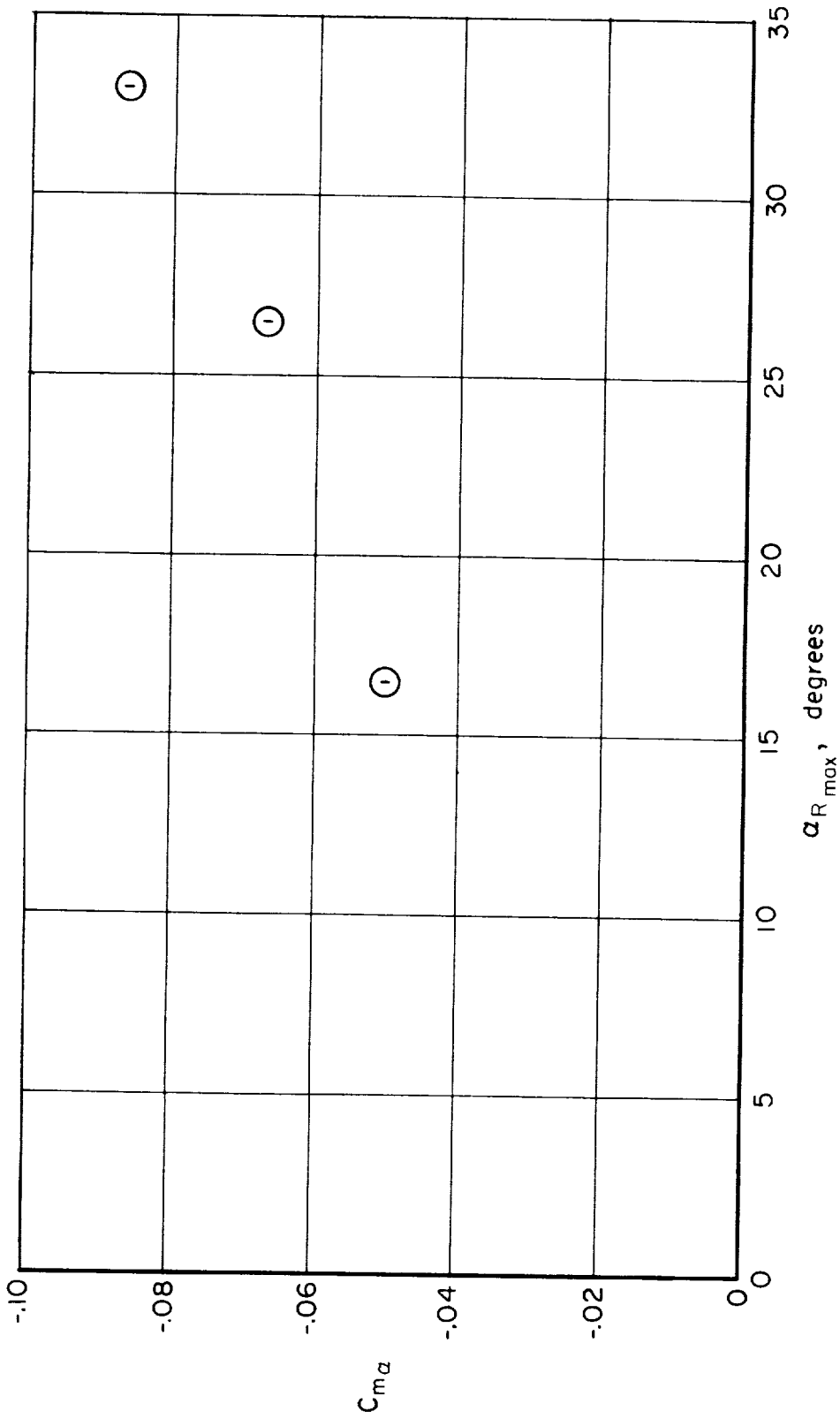


Figure 5.- Static stability results (linear analysis of raw data).

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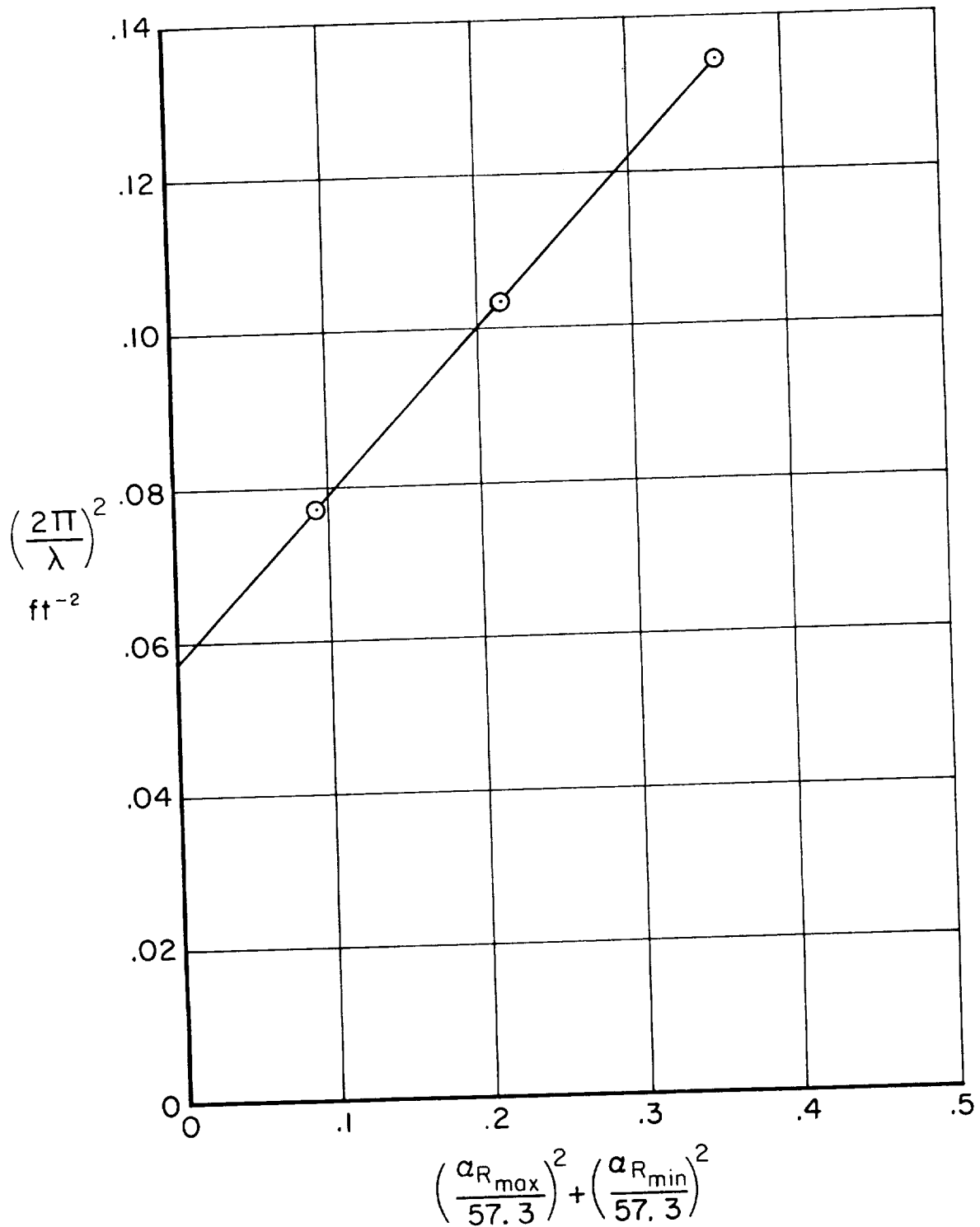


Figure 6.- Frequency parameter vs. amplitude parameter.

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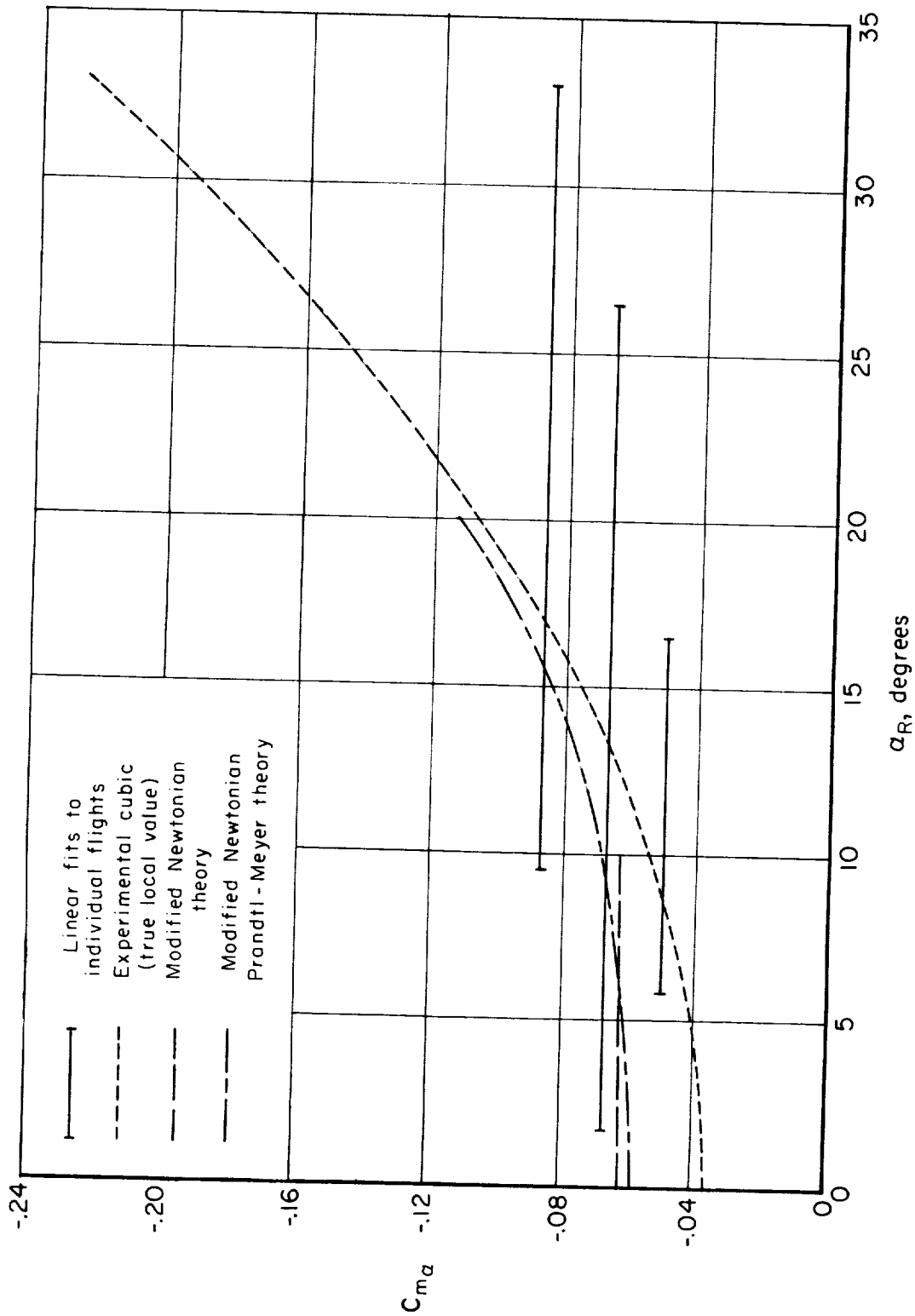


Figure 7.- Static stability results.

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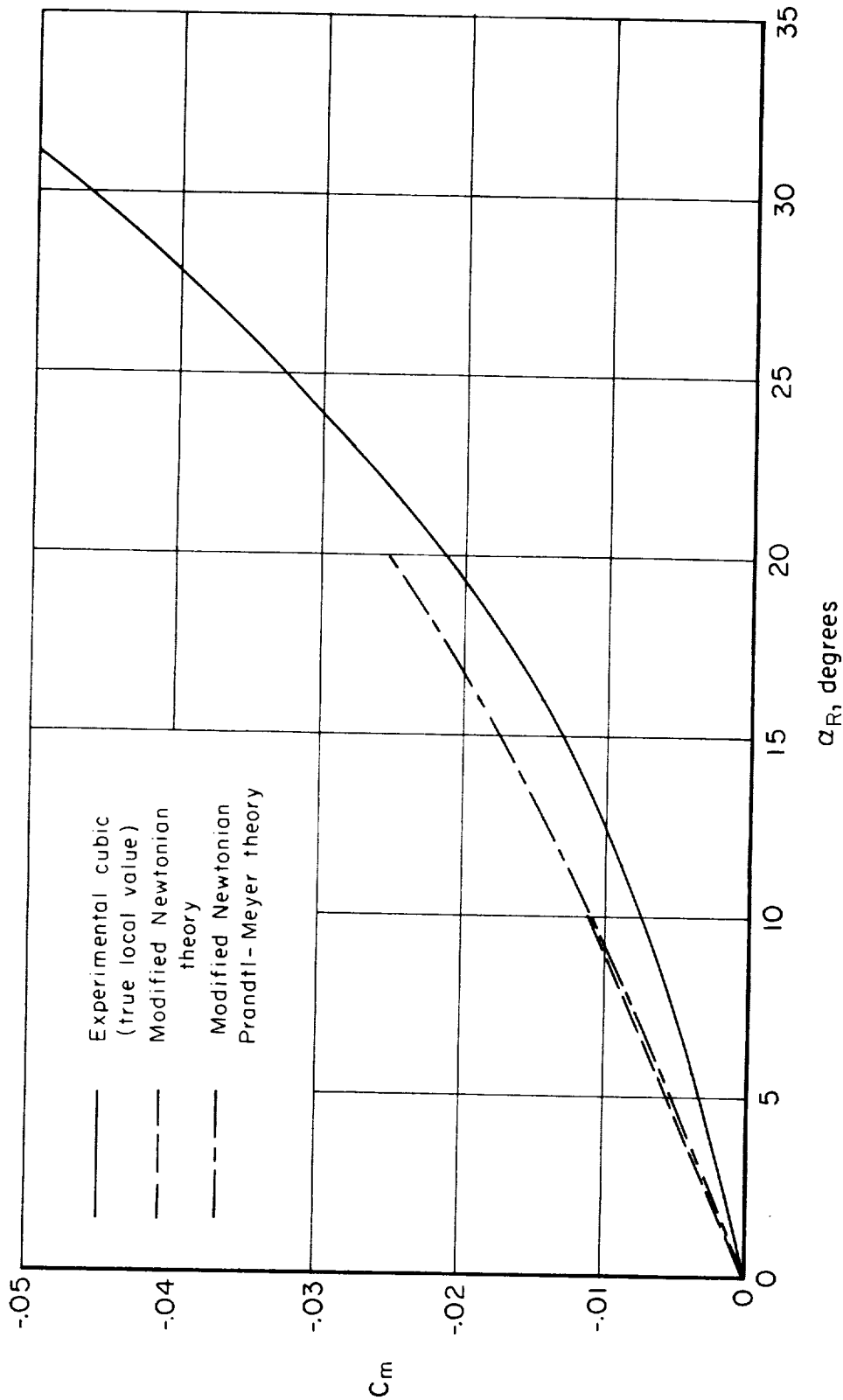


Figure 8.- Pitching-moment curve.

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1. **Introduction**

2. **Background**

3. **Methodology**

4. **Results**

5. **Discussion**

6. **Conclusion**

7. **References**

8. **Appendix**

9. **Index**

10. **Table of Contents**

11. **Figure 1**

12. **Figure 2**

13. **Figure 3**

14. **Figure 4**

15. **Figure 5**

16. **Figure 6**

17. **Figure 7**

18. **Figure 8**

19. **Figure 9**

20. **Figure 10**

21. **Figure 11**

22. **Figure 12**

23. **Figure 13**

24. **Figure 14**

25. **Figure 15**

26. **Figure 16**

27. **Figure 17**

28. **Figure 18**

29. **Figure 19**

30. **Figure 20**

31. **Figure 21**

32. **Figure 22**

33. **Figure 23**

34. **Figure 24**

35. **Figure 25**

36. **Figure 26**

37. **Figure 27**

38. **Figure 28**

39. **Figure 29**

40. **Figure 30**

41. **Figure 31**

42. **Figure 32**

43. **Figure 33**

44. **Figure 34**

45. **Figure 35**

46. **Figure 36**

47. **Figure 37**

48. **Figure 38**

49. **Figure 39**

50. **Figure 40**

51. **Figure 41**

52. **Figure 42**

53. **Figure 43**

54. **Figure 44**

55. **Figure 45**

56. **Figure 46**

57. **Figure 47**

58. **Figure 48**

59. **Figure 49**

60. **Figure 50**

61. **Figure 51**

62. **Figure 52**

63. **Figure 53**

64. **Figure 54**

65. **Figure 55**

66. **Figure 56**

67. **Figure 57**

68. **Figure 58**

69. **Figure 59**

70. **Figure 60**

71. **Figure 61**

72. **Figure 62**

73. **Figure 63**

74. **Figure 64**

75. **Figure 65**

76. **Figure 66**

77. **Figure 67**

78. **Figure 68**

79. **Figure 69**

80. **Figure 70**

81. **Figure 71**

82. **Figure 72**

83. **Figure 73**

84. **Figure 74**

85. **Figure 75**

86. **Figure 76**

87. **Figure 77**

88. **Figure 78**

89. **Figure 79**

90. **Figure 80**

91. **Figure 81**

92. **Figure 82**

93. **Figure 83**

94. **Figure 84**

95. **Figure 85**

96. **Figure 86**

97. **Figure 87**

98. **Figure 88**

99. **Figure 89**

100. **Figure 90**

101. **Figure 91**

102. **Figure 92**

103. **Figure 93**

104. **Figure 94**

105. **Figure 95**

106. **Figure 96**

107. **Figure 97**

108. **Figure 98**

109. **Figure 99**

110. **Figure 100**

111. **Figure 101**

112. **Figure 102**

113. **Figure 103**

114. **Figure 104**

115. **Figure 105**

116. **Figure 106**

117. **Figure 107**

118. **Figure 108**

119. **Figure 109**

120. **Figure 110**

121. **Figure 111**

122. **Figure 112**

123. **Figure 113**

124. **Figure 114**

125. **Figure 115**

126. **Figure 116**

127. **Figure 117**

128. **Figure 118**

129. **Figure 119**

130. **Figure 120**

131. **Figure 121**

132. **Figure 122**

133. **Figure 123**

134. **Figure 124**

135. **Figure 125**

136. **Figure 126**

137. **Figure 127**

138. **Figure 128**

139. **Figure 129**

140. **Figure 130**

141. **Figure 131**

142. **Figure 132**

143. **Figure 133**

144. **Figure 134**

145. **Figure 135**

146. **Figure 136**

147. **Figure 137**

148. **Figure 138**

149. **Figure 139**

150. **Figure 140**

151. **Figure 141**

152. **Figure 142**

153. **Figure 143**

154. **Figure 144**

155. **Figure 145**

156. **Figure 146**

157. **Figure 147**

158. **Figure 148**

159. **Figure 149**

160. **Figure 150**

161. **Figure 151**

162. **Figure 152**

163. **Figure 153**

164. **Figure 154**

165. **Figure 155**

166. **Figure 156**

167. **Figure 157**

168. **Figure 158**

169. **Figure 159**

170. **Figure 160**

171. **Figure 161**

172. **Figure 162**

173. **Figure 163**

174. **Figure 164**

175. **Figure 165**

176. **Figure 166**

177. **Figure 167**

178. **Figure 168**

179. **Figure 169**

180. **Figure 170**

181. **Figure 171**

182. **Figure 172**

183. **Figure 173**

184. **Figure 174**

185. **Figure 175**

186. **Figure 176**

187. **Figure 177**

188. **Figure 178**

189. **Figure 179**

190. **Figure 180**

191. **Figure 181**

192. **Figure 182**

193. **Figure 183**

194. **Figure 184**

195. **Figure 185**

196. **Figure 186**

197. **Figure 187**

198. **Figure 188**

199. **Figure 189**

200. **Figure 190**

201. **Figure 191**

202. **Figure 192**

203. **Figure 193**

204. **Figure 194**

205. **Figure 195**

206. **Figure 196**

207. **Figure 197**

208. **Figure 198**

209. **Figure 199**

210. **Figure 200**

211. **Figure 201**

212. **Figure 202**

213. **Figure 203**

214. **Figure 204**

215. **Figure 205**

216. **Figure 206**

217. **Figure 207**

218. **Figure 208**

219. **Figure 209**

220. **Figure 210**

221. **Figure 211**

222. **Figure 212**

223. **Figure 213**

224. **Figure 214**

225. **Figure 215**

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228. **Figure 218**

229. **Figure 219**

1. 凡在本市行政区域内从事经营活动的个体工商户，均须依法向工商行政管理部门申请注册登记，领取营业执照。

2. 个体工商户应当在核准的经营范围内从事经营活动，不得擅自变更经营范围。

3. 个体工商户应当依法纳税，按时申报，足额缴纳。

4. 个体工商户应当遵守国家和地方的法律法规，诚信经营，不得从事违法经营活动。

5. 个体工商户应当自觉接受政府和社会的监督，维护市场秩序。

6. 个体工商户应当加强内部管理，建立健全财务制度，妥善保管账簿。

7. 个体工商户应当注重产品质量，不得生产、销售假冒伪劣商品。

8. 个体工商户应当遵守劳动法律法规，保障劳动者的合法权益。

9. 个体工商户应当积极参与社会公益事业，履行社会责任。

10. 个体工商户应当自觉维护环境卫生，不得随意丢弃垃圾。

11. 个体工商户应当遵守消防安全规定，加强防火安全。

12. 个体工商户应当遵守交通法规，不得违规占道经营。

13. 个体工商户应当遵守网络经营相关规定，不得发布违法信息。

14. 个体工商户应当自觉接受信用评价，维护自身信誉。

15. 个体工商户应当依法解决纠纷，不得采取暴力手段。

16. 个体工商户应当遵守环境保护规定，不得污染环境。

17. 个体工商户应当遵守消费者权益保护规定，不得侵害消费者权益。

18. 个体工商户应当遵守公平竞争规定，不得实施不正当竞争行为。

19. 个体工商户应当遵守反不正当竞争法，不得仿冒他人知名商品。

20. 个体工商户应当遵守反不正当竞争法，不得诋毁他人商誉。

21. 个体工商户应当遵守反不正当竞争法，不得侵犯他人商业秘密。

22. 个体工商户应当遵守反不正当竞争法，不得实施其他不正当竞争行为。

23. 个体工商户应当遵守反不正当竞争法，不得扰乱市场秩序。

24. 个体工商户应当遵守反不正当竞争法，不得损害社会公共利益。

25. 个体工商户应当遵守反不正当竞争法，不得违反法律、行政法规的其他规定。

[illegible]

1. The first part of the document is a title page. It contains the title "THE HISTORY OF THE UNITED STATES OF AMERICA" and the author "BY JAMES M. SMITH". It also includes a list of contents and a preface.

2. The second part of the document is a list of contents. It lists the chapters and sections of the book, along with their page numbers.

3. The third part of the document is a preface. It discusses the author's purpose in writing the book and the sources he used.

4. The fourth part of the document is the first chapter, titled "THE DISCOVERY OF AMERICA". It describes the early exploration of the continent by Christopher Columbus and other European explorers.

5. The fifth part of the document is the second chapter, titled "THE FIRST SETTLEMENTS". It discusses the early settlements of the United States, including Jamestown, Plymouth, and the Massachusetts Bay Colony.

6. The sixth part of the document is the third chapter, titled "THE REVOLUTIONARY WAR". It describes the events leading up to the war, the war itself, and the resulting independence of the United States.

7. The seventh part of the document is the fourth chapter, titled "THE CONSTITUTION". It discusses the drafting and ratification of the United States Constitution.

8. The eighth part of the document is the fifth chapter, titled "THE EARLY REPUBLIC". It discusses the early years of the United States under the Constitution, including the presidencies of George Washington and John Adams.

9. The ninth part of the document is the sixth chapter, titled "THE WESTERN EXPANSION". It discusses the westward movement of the United States, including the Louisiana Purchase and the Mexican War.

10. The tenth part of the document is the seventh chapter, titled "THE CIVIL WAR". It discusses the events leading up to the war, the war itself, and the resulting Reconstruction.

11. The eleventh part of the document is the eighth chapter, titled "THE RECONSTRUCTION". It discusses the Reconstruction period, including the Reconstruction Acts and the Reconstruction of the South.

12. The twelfth part of the document is the ninth chapter, titled "THE GILDED AGE". It discusses the period of rapid industrialization and economic growth in the United States.

13. The thirteenth part of the document is the tenth chapter, titled "THE PROGRESSIVE ERA". It discusses the Progressive Era, including the reforms of the time and the role of the federal government.

14. The fourteenth part of the document is the eleventh chapter, titled "THE WORLD WAR ERA". It discusses the United States' involvement in World War I and World War II.

15. The fifteenth part of the document is the twelfth chapter, titled "THE POST-WAR PERIOD". It discusses the period following World War II, including the Cold War and the Vietnam War.

16. The sixteenth part of the document is the thirteenth chapter, titled "THE PRESENT". It discusses the current state of the United States and its future.

17. The seventeenth part of the document is an index. It lists the names of people, places, and events mentioned in the book, along with their page numbers.

18. The eighteenth part of the document is a list of references. It lists the sources used by the author in writing the book.

19. The nineteenth part of the document is a list of illustrations. It lists the illustrations included in the book.

20. The twentieth part of the document is a list of footnotes. It lists the footnotes included in the book.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text outlines various methods for organizing and storing data, including digital databases and physical filing systems. It also mentions the need for regular audits and reviews to ensure the integrity of the information.

2. The second part of the document focuses on the role of communication in achieving organizational goals. It highlights the importance of clear and concise communication, both internally and externally. The text provides guidelines for effective communication, such as using appropriate language, listening actively, and providing feedback. It also discusses the benefits of open communication, including improved collaboration and decision-making.

3. The third part of the document addresses the challenges of managing a large organization. It identifies key areas of concern, such as resource allocation, time management, and conflict resolution. The text offers practical advice for overcoming these challenges, including prioritizing tasks, delegating responsibilities, and seeking support when needed. It also emphasizes the importance of maintaining a positive and motivated workforce.

4. The fourth part of the document discusses the importance of innovation and creativity in driving organizational success. It encourages employees to think outside the box and explore new ideas and solutions. The text provides examples of innovative practices and strategies, such as brainstorming sessions and cross-functional teams. It also mentions the need for a supportive environment that fosters creativity and encourages risk-taking.

5. The fifth part of the document focuses on the importance of continuous learning and development. It emphasizes that individuals and organizations must stay up-to-date with the latest trends and technologies. The text outlines various methods for learning, including formal education, on-the-job training, and self-directed learning. It also mentions the importance of setting learning goals and tracking progress.

6. The sixth part of the document discusses the importance of ethical behavior and integrity in the workplace. It outlines the principles of ethics and provides guidelines for making ethical decisions. The text emphasizes that ethical behavior is not only a moral obligation but also a key factor in building trust and credibility. It also mentions the importance of reporting unethical behavior and holding individuals accountable.

7. The seventh part of the document addresses the importance of work-life balance and employee well-being. It recognizes that employees need to have a healthy balance between their work and personal lives to perform at their best. The text provides suggestions for promoting work-life balance, such as flexible work arrangements and employee assistance programs. It also mentions the importance of taking breaks and prioritizing self-care.

8. The eighth part of the document discusses the importance of diversity and inclusion in the workplace. It emphasizes that a diverse and inclusive workforce is essential for innovation and success. The text outlines strategies for promoting diversity and inclusion, such as recruiting from diverse sources and providing training on unconscious bias. It also mentions the importance of creating a safe and respectful environment for all employees.

9. The ninth part of the document focuses on the importance of customer satisfaction and loyalty. It emphasizes that providing excellent customer service is a key factor in building a successful business. The text provides guidelines for improving customer service, such as listening to customer feedback and resolving issues promptly. It also mentions the importance of building long-term relationships with customers.

10. The tenth part of the document discusses the importance of financial management and budgeting. It emphasizes that proper financial management is essential for the long-term success of any organization. The text outlines various methods for managing finances, including budgeting, forecasting, and monitoring expenses. It also mentions the importance of seeking professional advice when needed.

11. The eleventh part of the document addresses the importance of risk management and contingency planning. It recognizes that organizations face various risks, and it is essential to have a plan in place to mitigate them. The text outlines various methods for identifying and assessing risks, as well as developing contingency plans. It also mentions the importance of regularly reviewing and updating risk management strategies.

12. The twelfth part of the document discusses the importance of legal compliance and regulatory requirements. It emphasizes that organizations must adhere to all applicable laws and regulations to avoid legal consequences. The text outlines various methods for ensuring compliance, such as conducting regular audits and seeking legal advice. It also mentions the importance of staying up-to-date with changes in the legal landscape.

13. The thirteenth part of the document focuses on the importance of marketing and sales strategies. It emphasizes that effective marketing and sales are essential for growing a business. The text outlines various methods for developing marketing and sales strategies, such as market research and target audience analysis. It also mentions the importance of using data to inform decision-making.

14. The fourteenth part of the document discusses the importance of human resources management. It emphasizes that managing human resources effectively is a key factor in organizational success. The text outlines various methods for managing human resources, including recruiting, training, and performance management. It also mentions the importance of creating a positive work environment.

15. The fifteenth part of the document addresses the importance of technology and digital transformation. It recognizes that technology is a key driver of innovation and growth. The text outlines various methods for implementing digital transformation, such as investing in new technologies and training employees. It also mentions the importance of ensuring data security and privacy.

16. The sixteenth part of the document discusses the importance of sustainability and environmental responsibility. It emphasizes that organizations have a responsibility to protect the environment and promote sustainable practices. The text outlines various methods for achieving sustainability, such as reducing carbon footprint and using renewable energy. It also mentions the importance of reporting on sustainability efforts.

17. The seventeenth part of the document focuses on the importance of corporate governance and transparency. It emphasizes that strong corporate governance is essential for building trust and credibility. The text outlines various methods for improving corporate governance, such as establishing clear policies and procedures. It also mentions the importance of being transparent about financial and operational information.

18. The eighteenth part of the document discusses the importance of international trade and globalization. It recognizes that organizations are increasingly operating in a global market. The text outlines various methods for navigating international trade, such as understanding trade agreements and cultural differences. It also mentions the importance of building a global network.

19. The nineteenth part of the document addresses the importance of crisis management and disaster recovery. It recognizes that organizations may face unexpected crises, and it is essential to have a plan in place to respond effectively. The text outlines various methods for developing crisis management and disaster recovery plans, such as conducting drills and simulations. It also mentions the importance of communicating clearly during a crisis.

20. The twentieth part of the document discusses the importance of innovation and research and development. It emphasizes that innovation is a key driver of growth and competitive advantage. The text outlines various methods for fostering innovation, such as encouraging experimentation and collaboration. It also mentions the importance of protecting intellectual property.

21. The twenty-first part of the document focuses on the importance of branding and reputation management. It emphasizes that a strong brand and positive reputation are essential for success. The text outlines various methods for building a strong brand and managing reputation, such as consistent messaging and monitoring online reviews. It also mentions the importance of responding to negative feedback.

22. The twenty-second part of the document discusses the importance of financial reporting and analysis. It emphasizes that accurate financial reporting is essential for informed decision-making. The text outlines various methods for improving financial reporting, such as using standardized formats and providing detailed analysis. It also mentions the importance of seeking professional advice.

23. The twenty-third part of the document addresses the importance of legal and regulatory updates. It recognizes that laws and regulations are constantly changing, and it is essential to stay up-to-date. The text outlines various methods for staying up-to-date, such as subscribing to legal newsletters and attending seminars. It also mentions the importance of consulting with legal counsel.

24. The twenty-fourth part of the document focuses on the importance of employee engagement and motivation. It emphasizes that engaged and motivated employees are more productive and committed. The text outlines various methods for improving employee engagement, such as providing meaningful work and recognizing achievements. It also mentions the importance of creating a positive work environment.

25. The twenty-fifth part of the document discusses the importance of strategic planning and vision. It emphasizes that a clear vision and strategic plan are essential for long-term success. The text outlines various methods for developing a strategic plan, such as conducting a SWOT analysis and setting clear goals. It also mentions the importance of regularly reviewing and updating the plan.

26. The twenty-sixth part of the document addresses the importance of customer segmentation and targeting. It recognizes that different customer groups have different needs and preferences. The text outlines various methods for segmenting and targeting customers, such as using demographic data and conducting surveys. It also mentions the importance of tailoring marketing and sales efforts to specific segments.

27. The twenty-seventh part of the document focuses on the importance of supply chain management. It emphasizes that an efficient supply chain is essential for delivering products and services. The text outlines various methods for improving supply chain management, such as optimizing inventory levels and building strong relationships with suppliers. It also mentions the importance of monitoring supply chain risks.

28. The twenty-eighth part of the document discusses the importance of financial forecasting and budgeting. It emphasizes that accurate financial forecasting is essential for planning and decision-making. The text outlines various methods for improving financial forecasting, such as using historical data and considering market trends. It also mentions the importance of regularly reviewing and updating forecasts.

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1. The first part of the document is a title page. It contains the title of the document, the author's name, and the date of the document. The title is "The First Part of the Document". The author's name is "John Doe". The date is "12/12/2023".

2. The second part of the document is a table of contents. It lists the sections of the document and their corresponding page numbers. The sections are "Introduction", "Section 1", "Section 2", "Section 3", "Section 4", "Section 5", "Section 6", "Section 7", "Section 8", "Section 9", "Section 10", "Section 11", "Section 12", "Section 13", "Section 14", "Section 15", "Section 16", "Section 17", "Section 18", "Section 19", "Section 20", "Section 21", "Section 22", "Section 23", "Section 24", "Section 25", "Section 26", "Section 27", "Section 28", "Section 29", "Section 30", "Section 31", "Section 32", "Section 33", "Section 34", "Section 35", "Section 36", "Section 37", "Section 38", "Section 39", "Section 40", "Section 41", "Section 42", "Section 43", "Section 44", "Section 45", "Section 46", "Section 47", "Section 48", "Section 49", "Section 50", "Section 51", "Section 52", "Section 53", "Section 54", "Section 55", "Section 56", "Section 57", "Section 58", "Section 59", "Section 60", "Section 61", "Section 62", "Section 63", "Section 64", "Section 65", "Section 66", "Section 67", "Section 68", "Section 69", "Section 70", "Section 71", "Section 72", "Section 73", "Section 74", "Section 75", "Section 76", "Section 77", "Section 78", "Section 79", "Section 80", "Section 81", "Section 82", "Section 83", "Section 84", "Section 85", "Section 86", "Section 87", "Section 88", "Section 89", "Section 90", "Section 91", "Section 92", "Section 93", "Section 94", "Section 95", "Section 96", "Section 97", "Section 98", "Section 99", "Section 100". The page numbers are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

3. The third part of the document is the introduction. It contains a brief overview of the document and its purpose. The introduction is written by John Doe.

4. The fourth part of the document is the main body. It contains the main content of the document. The main body is divided into 100 sections. Each section contains a brief overview of the section and its purpose. The sections are numbered 1 through 100.

5. The fifth part of the document is the conclusion. It contains a brief summary of the document and its findings. The conclusion is written by John Doe.

6. The sixth part of the document is the appendix. It contains additional information related to the document. The appendix is divided into 10 sections. Each section contains a brief overview of the section and its purpose. The sections are numbered 1 through 10.

7. The seventh part of the document is the bibliography. It contains a list of references used in the document. The bibliography is divided into 10 sections. Each section contains a list of references. The sections are numbered 1 through 10.

8. The eighth part of the document is the index. It contains a list of keywords and their corresponding page numbers. The index is divided into 10 sections. Each section contains a list of keywords. The sections are numbered 1 through 10.

9. The ninth part of the document is the glossary. It contains a list of terms and their definitions. The glossary is divided into 10 sections. Each section contains a list of terms. The sections are numbered 1 through 10.

10. The tenth part of the document is the end matter. It contains the final page of the document. The end matter is written by John Doe.

A vertical strip of five black and white photographs showing the progression of a person's face from a neutral expression to a full, wide smile. The images are arranged vertically, with the top image showing a neutral face and the bottom image showing a full, wide smile. The person's face is the central focus of each image, with the background being dark and out of focus. The progression of the smile is clearly visible, with the mouth opening wider and the eyes crinkling in each successive image. The overall effect is one of joy and happiness.

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